



## Dworshak Reservoir Quarterly Report

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April, May, June 2004

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Figure 2. Almar research trawler on Dworshak Reservoir, July, 2004.

### Points of Interest:

- Low detection rate of fish in front of turbine 3, low vulnerability to entrainment.
- Kokanee densities near dam remain low.
- Trawler borrowed from the Pend Oreille Project to help determine relationship between reservoir productivity and kokanee growth and density.
- Lower densities result in larger age 2 kokanee this year.
- Limnology sampling started.
- Reservoir-wide kokanee abundance survey scheduled for mid-July.

### Kokanee Entrainment Assessment

The forebay area of the reservoir was off-limits as a safety precaution, May 27th through June 12th, since the U.S. Army Corps of Engineers was discharging water over the spillway of Dworshak Dam (Figure 1). The reservoir outlets (RO's) were not operated again this quarter.

We were able to sample seven 24 hr periods in this quarter, despite a period of restricted access to the area near the turbines. All sampling took place in front of turbine intake 3 (Table 1).

This entrainment assessment monitoring provides basic information on the number of detected fish immediately in front of operating turbines and reservoir outlets (ROs),

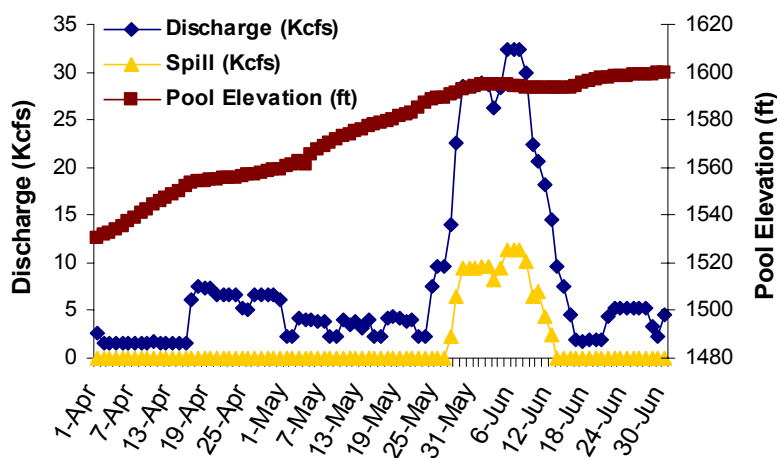


Figure 1. Total discharge and spill of water through Dworshak Dam (cubic feet per second x 1,000) and reservoir pool elevation (feet above mean sea level), April—June, 2004.

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Table 1. Entrainment assessment sampling dates; intakes sampled, discharge in cubic feet per second, pool elevation, and depth of water withdrawal; and detection rate of fish per hour, April—July, 2004.

Date	Turbine #	Discharge (cfs)	Pool Elevation (ft)	Withdrawal Depth (ft)	Detections (#/hr)
Apr 20	3	5200	1555	89	0.04
Apr 21	3	5200	1555	89	0.00
May 25	3	5300	1589	39	0.63
May 26	3	5300	1589	39	0.57
June 14	3	4700	1593	43	0.84
June 15	3	4700	1594	44	0.16
June 22	3	5100	1598	56	0.18

## Kokanee Entrainment Assessment

(Continued from page 1)

representative of entrainment vulnerability. This information helps to predict the degree of variability in fish entrainment expected between time of day, seasons, discharge rate, and intake openings.

Again, we detected very few fish during our sampling. The highest fish detection rate occurred during the dawn and night periods and continued to remain the lowest during the day. Overall, the low detection rate suggests a low vulnerability to entrainment during late spring/early summer.

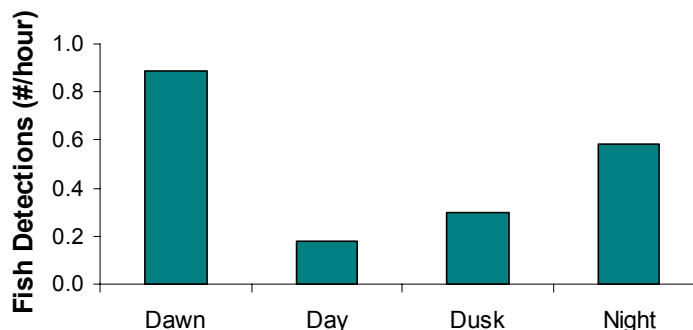


Figure 3. Mean fish detection rate, comparison between dawn, day, dusk, and night time of day periods obtained from six 24 hour entrainment assessment sampling periods, between April 21st and June 23rd, 2004. All sampling took place in front of turbine unit #3.

## Trawl Sampling

On May 18th we were able to trailer the Almar™ trawler from the Lake Pend Oreille Research Project office in Bayview to Dworshak Reservoir (Figure 1). We are borrowing this 32 foot research vessel to conduct monthly trawl surveys on the nights of the new moon each month.



Figure 4. Dworshak Research staff, Josh Goodwin, retrieving trawl net cod-end into research vessel.

We have prepared the trawler by doing some repairs, maintenance, and net calibration, which involves determining the relationship between the trawl net depth with varying engine speed and length of trawl cable spooled out in the water.

We will be trawling once each month throughout Dworshak Reservoir, from May through November (Figure 4). Information summarized from limnology, zooplankton, and kokanee: food habits, age-at-length, growth, and density will then be used to define the relationship between the kokanee population and changes in nutrient concentrations in Dworshak Reservoir.

Kokanee will be trawled near representative limnological site

locations within each reservoir section, and length, weight, scale, and stomach samples will be collected (Figure 5). Fish scales will be aged and stomach samples identified and weighed.

We captured kokanee as small as 0.8 inches (age 0) to as large as 12.3 inches (age 2). Although data is very preliminary we calculated average monthly growth rates of 0.2, 1.0, and 0.5 inches for age 0, age 1, and age 2 fish respectively, between May and June, 2004 (Figure 6).

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Figure 5. Processing of trawl-captured kokanee to obtain length, weight, age, growth rate and diet data.

## Trawl Sampling

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In the future, Kokanee food habits and caloric intake data will also be used for predictive modeling of the kokanee population dynamics with changes in productivity and zooplankton density. In addition a trawl survey will encompass the whole reservoir in mid July. The age-at-length data obtained from this sampling will also help us to more accurately split-up our hydroacoustic density and abundance estimates according to kokanee age. Trawling should provide us a representative sample of kokanee lengths and ages in the reservoir (Figure 7).

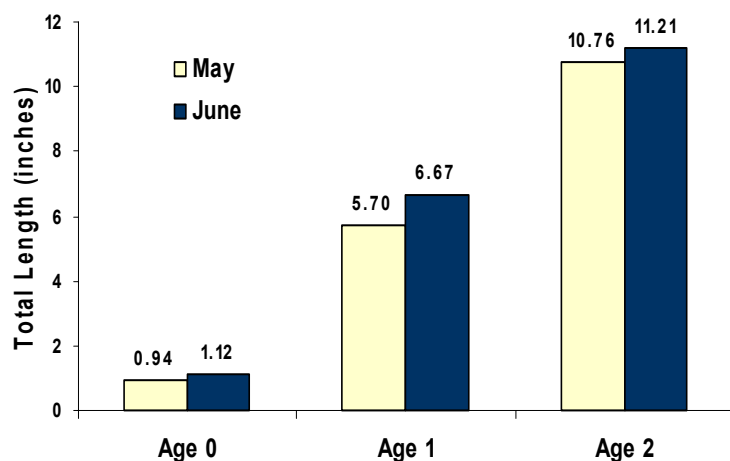


Figure 6. Comparison of average size of May versus June trawl-caught kokanee, for each of three ages of kokanee.



Figure 7. A sample of trawl-caught kokanee from each of three age classes; age 0, age 1, and age 2.

## Kokanee Densities near Dworshak Dam

We continued monthly hydroacoustic surveys within the forebay area of the reservoir, to determine the time of the year most critical for kokanee entrainment losses and determine when kokanee densities are high enough to feasibly test strobe lights.

Kokanee densities near Dworshak Dam remained low this spring, despite this time period is when we have previously seen our highest densities of the year. Kokanee densities were as low as 28 fish/acre in April and reached 107 fish/acre in May; however, this is still less than half the densities seen last year during these months (Figure 4).

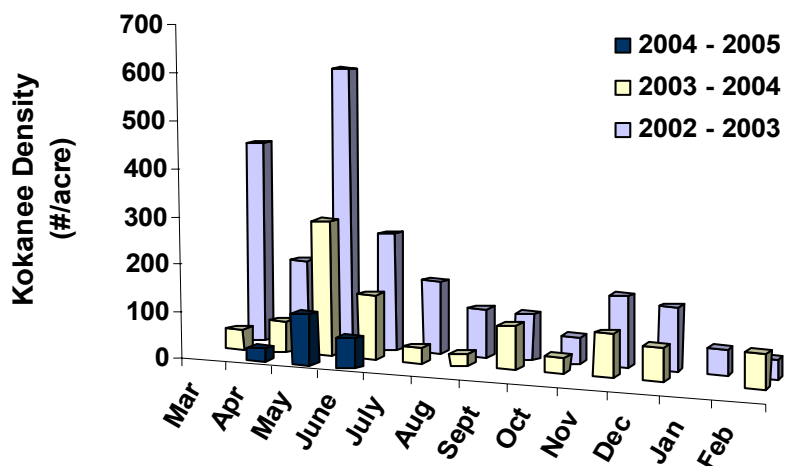


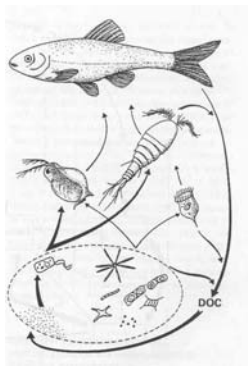
Figure 8. Comparison of kokanee density (fish/acre) in the forebay area of Dworshak Reservoir March, 2002 through June, 2004.

## Limnological Sampling

During May we started monthly limnological sampling throughout the reservoir and below Dworshak Dam. Eleven limnological stations will be sampled monthly from May through November. This research is being conducted to assess the effects of dam operations on primary and secondary production (and potential loss); and influence of this production on annual kokanee population stability (density, length-at-age, growth, and survival).

At each station we are measuring dissolved oxygen, water temperature and transparency; and collecting water and zooplankton samples. Water samples are then analyzed for total dissolved solids (TDS); nitrate nitrogen ( $\text{NO}_3$ ); orthophosphorous (OP) and total phosphorous (TP); phosphates; and chlorophyll.

Data collected will be used to re-evaluate the relationship between reservoir productivity and kokanee growth and densities. In addition, this information can then be used to calculate the current annual phosphorous load ( $L_p$ ) for the reservoir, the epilimnetic water renewal rate, and the mean  $\text{NO}_3$  and TP concentrations, and  $\text{NO}_3$ :TP ratios. These values will be critical in determining a prospective enrichment rate to maintain high kokanee densities without reducing growth rate or angler catchability. Complete results will be summarized and reported once multiple months data are analyzed and available to make comparisons and conclusions.



## Next Quarter's Activities

During the next quarter, we will continue entrainment and forebay density surveys. We will especially concentrate our effort upon entrainment sampling in front of the reservoir outlets (RO's), since they may be used in addition to the turbines to supplement 'summer salmon flows' to help cool the Lower Snake River.

We will finish writing the 2003 annual report and continue analysis and interpretation of entrainment echograms. We will also continue limnological sampling throughout the reservoir once per month..

During July we will conduct our annual reservoir-wide hydroacoustic kokanee population estimation survey. We will also trawl for kokanee to obtain representative length-at-age samples from throughout the reservoir to further support our population estimates. And lastly, we will conduct the annual kokanee spawner counts during the last week of September in select tributaries to the North Fork Clearwater River.

## Internet Links to more info:

**Are you looking for past quarterly and annual reports concerning Dworshak Reservoir research ?**

They can be found on Idaho Fish and Game's website at (<http://fishandgame.idaho.gov/tech/reports>). Click on the **Fisheries** link, then do a word search on '**Dworshak**'.

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